

P A T E N T C L A I M S

1. Method for joining functional parts of hydraulic or pneumatic operating devices, in particular of operating rams such as props for underground mining, with a first part having an outer wall section and a second part having an inner wall section, the parts can be joined together and connected to each other with mutually overlapping wall sections, **characterised by** the steps of arranging the parts with mutually overlapping wall sections and forming a cavity by means of depressions provided in both wall sections, and filling of the cavity with a fluid casting compound of plastic, which in its hardened or solidified state prevents relative movements between the parts by means of a positive form fit.
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2. Method in accordance with Claim 1, **characterised in that** the casting compound is an injection casting compound, which in the plasticized state can be injected into the cavity at high pressure.
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3. Method in accordance with Claim 1 or 2, **characterised in that** before the filling or injection of the casting compound at least the wall sections of the parts that are to be connected together are pre-heated.
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4. Method in accordance with one of the Claims 1 to 3, **characterised in that** a guide sleeve or similar for an axially movable body is formed at the same time as the joining connection on the inner surface and/or outer surface of the first and/or second part.
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5. Method in accordance with Claim 4, **characterised in that** a sealing system for the guide sleeve is cast at the same time as the guide sleeve, or before the formation of the guide sleeve.

6. Joining connection for functional parts of hydraulic or pneumatic operating devices, in particular of operating rams such as props for underground mining, with a first part having
5 an outer wall section and second part having an inner wall section, which parts can be joined together and connected to each other with mutually overlapping wall sections,
characterised in that both wall sections (14',15'; 34,35; 54,55) comprise a depression (16,17; 36,37; 56,57), which in
10 the connected state form a cavity, being filled with a fluid casting compound of plastic, which after its hardening or solidification connects the two parts (2,3; 7,8; 2,11) to each other by means of a positive form fit.

15 7. Joining connection in accordance with Claim 6, **characterised in that** one of the parts comprises a filling or injection opening (18; 48; 58) for the casting compound, leading via a casting channel (26; 46,47; 66) into the corresponding depression.

20 8. Joining connection in accordance with Claim 6 or 7,
characterised in that both wall sections (14',15'; 34,35; 54,55) comprise a plurality of depressions (16,17;36;37;56,57).

25 9. Joining connection in accordance with one of the Claims 6 to 8, **characterised in that** the depressions consist of circumferential corrugations, grooves, channels or similar.

30 10. Joining connection in accordance with Claim 9,
characterised in that the corrugations, grooves, channels or similar are aligned at right-angles to the separating gap between the parts.

11. Joining connection in accordance with Claim 9 or 10, **characterised in that** the corrugations, grooves, channels or similar are having faces (38,39; 40,41) rising up to the wall section (14',15'; 34,35; 54,55).

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12. Joining connection in accordance with Claim 11, **characterised in that** the faces (38,39; 40,41) are angled at right-angles to each other and/or the angle of inclination (α) of the longer face (38; 41) to the wall section (35; 34) is 25° to 35°, in particular is approximately 30°.

13. Joining connection in accordance with one of the Claims 6 to 12, **characterised in that** the corrugations, grooves, channels or similar are arranged in the wall sections of both parts such that the casting compound solidifies or hardens to rings with small cross-sections, preferably right-angled cross-sections.

14. Joining connection in accordance with one of the Claims 6 to 13, **characterised in that** adjacent depressions (36; 37) in the wall sections (34; 35) are separated from each other by a web (42; 43), and in the assembled state the webs (42; 43) of the wall sections (34, 35) of the first and second parts (7,8) lie directly opposed to each other.

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15. Joining connection in accordance with one of the Claims 6 to 14, **characterised in that** in the wall section (15; 34; 54) of one of the parts (3; 7; 11) a distribution channel (19; 49; 59) is provided running at right-angles to all depressions (16,17; 36,37; 56,57), and preferably the casting channel (26; 47; 66) leads into the distribution channel (19; 49; 59).

16. Joining connection in accordance with one of the Claims 6 to 15, **characterised in that** the depression (57) of the wall

section (54) of one of the parts (11) leads into a feeder channel (72) to an annular space (71), adapted to be filled with the casting compound in order to cast a guide sleeve (70) or similar for a body (7) that is axially movable in the 5 interior of this part (11) or for the part itself, and/or that via the feeder channel a sealing system for the guide sleeve can be cast.

17. Joining connection in accordance with one of the Claims 6
10 to 16, **characterised in that** the casting compound is an
injection casting compound.

18. Method or joining connection in accordance with one of the
Claims 1 to 17, **characterised in that** the casting compound of
15 plastic in the hardened or solidified state withstands shear
force loads of at least 20 N/mm², preferably at least 45 N/mm².

19. Method or joining connection in accordance with one of the
Claims 1 to 18, **characterised in that** the casting compound is a
20 thermoplastic, in particular a polyamide or a polyphenylether
or a polyterephthalate, in particular a
polybutyleneterephthalate, or a polyvinylidenfluoride.

20. Method or joining connection in accordance with one of the
25 Claims 1 to 19, **characterised in that** the casting compound is a
fibre-reinforced casting compound, in particular a glass fibre-
reinforced casting compound.

21. Method or joining connection in accordance with one of the
30 Claims 1 to 20, **characterised in that** the parts form the
cylinder of a hydraulic ram (10, 100) and one of the parts (2;
102,105) consists of a cylindrical tube section, and the other
part (3; 103; 104) consists of a cylinder cover.

22. Method or joining connection in accordance with Claim 21, **characterised in that** the cylinder cover (3) is integrally provided with a linking eye.

5 23. Method or joining connection in accordance with one of the Claims 1 to 20, **characterised in that** the parts (102,103; 102,111; 104,105; 105,112; 107,108) form one stage of a multi-stage hydraulic prop (100).

10 24. Method or joining connection in accordance with one of the Claims 1 to 20, **characterised in that** the first part (2; 102; 105) consists of the cylinder of an operating ram and the second part (11; 111; 112) consists of a sealing ring for the cylinder pressure chamber, which is centrally passed through by 15 the piston rod or an inner cylinder.

25. Method or joining connection in accordance with one of the Claims 1 to 20, **characterised in that** the parts (7,8;107,108) form the piston of a operating ram and the first part (7; 107) 20 consists of a piston rod, and the second part (8; 108) consists of a piston ring circular in cross-section.

26. Method or joining connection in accordance with one of the Claims 1 to 25, **characterised in** at least one ventilation hole 25 leading into one of the depressions.

27. Method or joining connection in accordance with one of the Claims 1 to 26, **characterised in** a releasable screwed connection between the wall sections of the first part and the 30 second part.

28. Method or joining connection in accordance with one of the Claims 1 to 27, **characterised in that** the separating gap

between the parts that are to be connected is sealed by the joining connection.

29. Method to release the joining connection in accordance with
5 one of the Claims 6 to 28, in particular for the maintenance of
the functional parts of the operating device, **characterised by**
the steps of heating, in particular inductive heating of the
wall sections, for plasticisation of the plastic material of
the joining connection, separating of the functional parts and
10 removal of the plastic material residues from the depressions.